DOCUMENT RESUME

ED 033 843 SE 006 767

AUTHOR	Busch, Phyllis S.
TITLE	Seven Steps for Developing an Outdoor School Area for Teaching Science-Conservation.
INSTITUTION	Ulster County Board of Cooperative Education Services, New Platz, N.Y.
Spons Agency	Office of Education (DHEW), Washington, D.C. Bureau of Elementary and Secondary Education.
Pub Date	69
Note	30p.
EDRS Price	EDRS Price MF-$0.25 HC-$1.60
Descriptors	*Conservation Education, Educational Programs, *Elementary School Science, Instruction, *Outdoor Education, Program Descriptions, *Program Guides, Program Planning, Science Activities
Identifiers	Elementary and Secondary Education Act Title III

Abstract

Presented are "Seven Steps" which can be utilized in developing an educational program focused on the outdoor environment. A map of an area likely to be found outside almost any school in any community is provided. On the map 19 teaching stations are indicated along with a description of each station. The descriptive material is followed by suggested teaching possibilities for the mapped outdoor area. A section is included for each grade level from K-8. The material for each level consists of (1) problems to be investigated, (2) science and conservation concepts, and (3) discussion questions. Samples of Discovery Guides as techniques for outdoor investigation are also presented, followed by a list of selected references. This work was prepared under an ESEA Title III contract. (ES)

OE-BESE TITLE III

ED033843

SEVEN STEPS

FOR DEVELOPING AN OUTDOOR SCHOOL AREA FOR TEACHING SCIENCE-CONSERVATION

By Dr. Phyllis S. Busch
Director, Project S.P.R.U.C.E.

SE 006 767

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

SEVEN STEPS FOR DEVELOPING AN OUTDOOR SCHOOL AREA FOR TEACHING SCIENCE-CONSERVATION

A Guide to Extending Teaching to Include the Total Environment

By

Phyllis S. Busch

S.P.R.U.C.E.
(Science Project Related to Upgrading Conservation Education)

A Title III: E.S.E.A. Project

Administered by:
Ulster County B.O.C.E.S.
New Paltz, New York 12561
1969

The work presented or reported herein was performed pursuant to a Grant from the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education and no official endorsement by the U.S. Office of Education should be inferred.

CONTENTS

Introduction 4

How to Develop the Use of School Outdoor Areas:
The Seven Steps 6

Map of a School Outdoor Area 8

Description of the Mapped Area 9

Problems, Concepts and Discussion Questions for Kindergarten 11

Problems, Concepts and Discussion Questions for Grade 1 12

Problems, Concepts and Discussion Questions for Grade 2 13

Problems, Concepts and Discussion Questions for Grade 3 14

Problems, Concepts and Discussion Questions for Grade 4 15

Problems, Concepts and Discussion Questions for Grade 5 16

Problems, Concepts and Discussion Questions for Grade 6 17

Problems, Concepts and Discussion Questions for Grade 7 18

Problems, Concepts and Discussion Questions for Grade 8 19

Discovery Guides 21

What They Are 21
Objectives of Discovery Guides 21
Examples of Four Discovery Guides 22
Description of Discovery Guides 22

Example #1 - Colors of Common Flowers
(suitable for Grades K, 1, 2) 23

Example #2 - Rock Materials
(suitable for Grades 3, 4) 24

Example #3 - Habitat Studies
(suitable for Grades 4, 5) 25

Example #4 - Plant Population Studies
(suitable for Grades 5, 6) 26

Selected Teacher References 29

INTRODUCTION

Why Use the Area Outside Schools?

Much that is wrong with our planet today stems from man's indifference or from his ignorance of the results of technology, the application of science.

People must learn how all living things interrelate with each other and with their environment, how altering any one affects all others. People must learn to assume responsibility for human actions, avoiding those which produce undesirable results.

Such understandings should be developed in science and social studies where we can begin including conservation as an important part of these subject matter areas. This training can affect attitudes and values if started with the young and continued from then on.

Science helps us to learn about the objects and events in the universe. Surely the objects and events are not limited to a book, or a film or the inside of a classroom. The environment outdoors where many changes are going on, naturally as well as artificially, is as important a place to study, to learn about and to explore as is the indoors. In fact, at times it may be more important to study outside than inside.

Outdoor areas where children go are suitable places for study. The purpose of this guide is to introduce the outdoor area of any school as a place for children to study ecological relationships, to use processes of science for investigation, to experiment, to learn, and to develop a sense of responsibility. Thus the immediate area outside of a school becomes the pupils' outdoor laboratory. It is as easy to use an outdoor area as it is to open the door. Eventually, there will be no indoor education versus outdoor. Good education will include the total environment.

How to Proceed in Developing the Usefulness of an Outdoor Area:

The Seven Steps which follow present a useful and tested guide so designed that any school can plan to develop and use its outdoor environment. A step by step procedure is outlined here.

Following the details of the seven steps is a map of an area likely to found outside almost any school, rural, suburban, or urban. Nineteen teaching stations are indicated followed by a description of each station.

This descriptive material is followed by suggested teaching possibilities of this outdoor mapped area. All of the teaching suggestions are based on the New York State science curricula.

There is a section for each grade level from K through 8. The material for each grade consists of three parts: Some Problems, Science and Conservation Concepts, Discussion Questions. The daily lessons, the instruction both indoors and outdoors, are left for each teacher to plan. No doubt many more problems for investigation will present themselves to pupils and teachers as will many more discussion questions. It is during these class activities and discussions that the children will be developing attitudes and values regarding important aspects of conservation.

Samples of Discovery Guides as techniques for outdoor investigations are presented next, followed by a list of selected references useful to teachers in this "indoor-outdoor" approach to teaching science-conservation.

PROJECT S.P.R.U.C.E.

Box 96A
Pine Plains, New York
12567

Step 1 - Call a planning meeting: a. Call a meeting to explain the concepts and plans for using the outdoor area outside any school as a laboratory for studying science-conservation. Present at this meeting should be the principal, teaching faculty, representatives from the PTA and Board of Education, the custodian and any interested members of the cummunity.

b. Organize a working committee. This consists of principal, custodian, teacher representatives from each grade, representative members from the Board of Education, PTA, etc.

Step 2 - Survey the area: a. Explore the area. This is carried out by as many of the appointed committee as possible. Others may be invited. List all resources in the area which have usefulness for teaching. (See map and stations)

b. Locate teaching stations at appropriate spots.

c. Plan a trail which will connect the teaching stations. Urban areas may not have a woodland trail but resources need to be designated all the same and a "trail" planned just as carefully.

Step 3 - Mark the area: a. Place a marker at each teaching station at a convenient place but above children's reach. Markers may be made from round canning lids. They are painted with white enamel, allowed to dry, then painted with numbers in black. When the numbers are dry, the lids are dipped in outdoor varnish. When dry, these can be nailed on posts or trees with aluminum nails.

Where discs are not practical, varnish luggage tags and tie them onto a stake.

At some stations, such as a rock or a post, the number might be painted directly on the surface.

b. In those places where a trail has to be cut, the trail can be indicated by ribbons tied to appropriate places or by laying a string along the length of the trail. The trail should be about three feet wide except at teaching stations where six feet is recommended.

Step 4 - Produce written materials: a. Distribute to each teacher a sketch of a sample map of the area upon which the trail and teaching stations are designated.

b. Prepare a descriptive outline of each teaching station.

c. Committees of teachers of each grade level draw up a list of problems which can be investigated outdoors. The stations where the investigations can be carried on are indicated next to each problem.

d. State concepts in science and conservation which children can develop as a result of the recommended investigations. (See section "Problems, Concepts and Discussion Questions)

e. Develop some techniques for children to use such as discovery guides. (See section "Discovery Guides")

Step 5 - Introduce the use of the outdoor area:

a. Hold a teachers' workshop and distribute copies of each of the five kinds of written materials prepared in the previous step (4).

b. Go outdoors and explore the trail, examining the possibilities of each station for solving problems as suggested. Consider access, safety, content, techniques, grade level, etc.

Step 6 - Evaluating:

a. Each teacher tests the materials provided with his class for a period of four to six weeks. They are tested for content, grade placement, feasibility, etc.

b. Each teacher notes suggestions for additions or deletions and corrections. Followup meetings are held, perhaps grade level meetings, to continue improvement of the written materials.

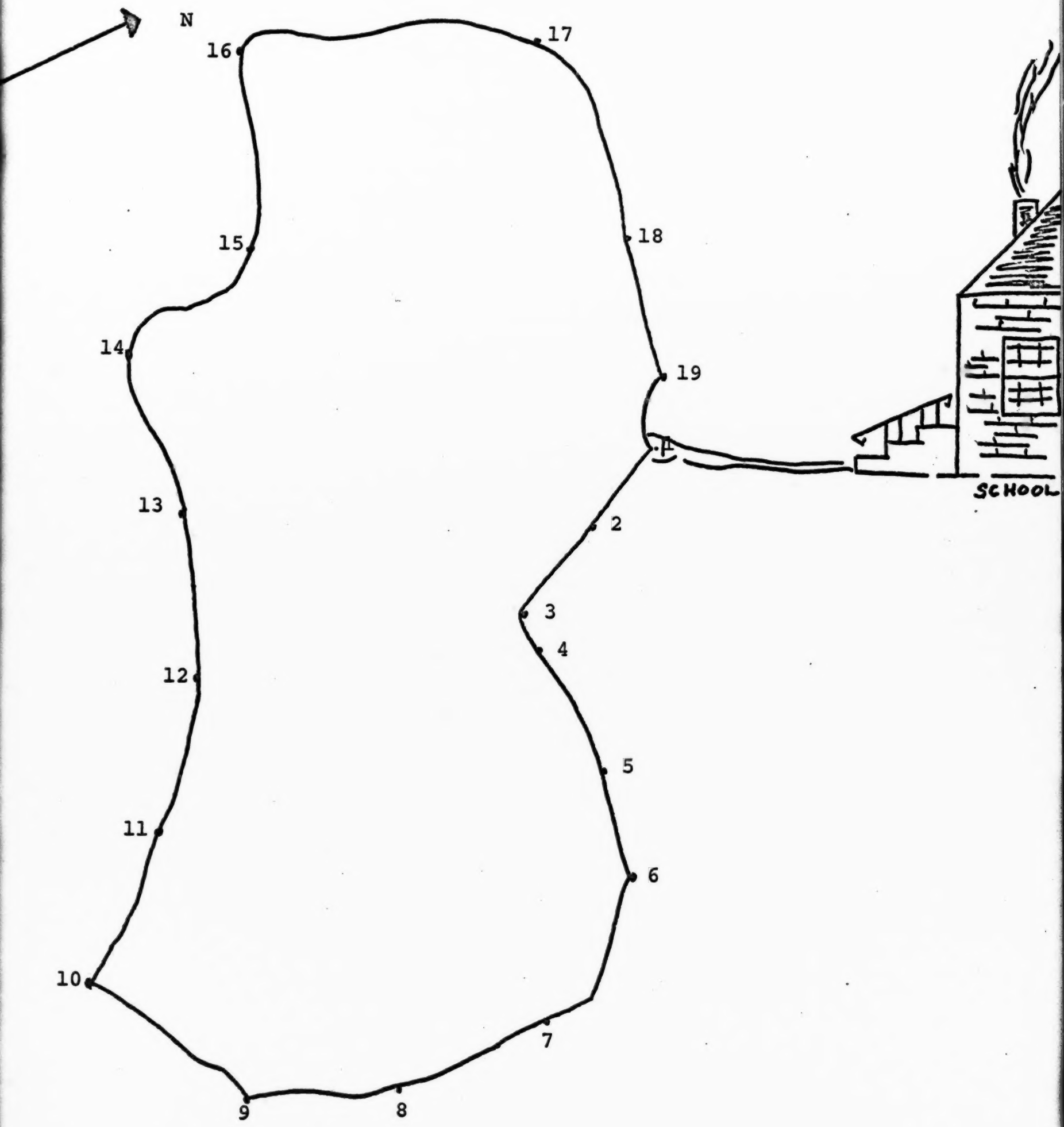
Step 7 - Produce the finished product:

The committee should examine all recommendations made by the teachers and develop a completed teaching guide consisting of:

A Teaching Guide:

a. cover
b. title page
c. contents
d. map of outdoor area with stations
e. for each grade level a list of problems with stations indicated for solving each problem, a list of concepts which children can develop as a result of their experiences and some recommended discussion questions
f. discovery guide techniques and other techniques
g. selected references for the teacher

MAP OF AN OUTDOOR SCHOOL AREA WITH NUMBERED TEACHING STATIONS



Description of the Teaching Stations of the Mapped Area

1. Dead Elm. Elms are rapidly dying because of the Dutch elm disease. The disease is caused by a fungus plant. The spores of the plant are carried on the legs of elm bark beetles. The bark loosens and falls as the tree dies.

2. Poison Ivy on Dead Stump on the Lawn. Dead stumps gradually crumble and enrich the soil by becoming part of it. Until this happens the stump serves as a home for animals. They find food or protection or both in or on the stump. Bacteria and fungi help in the process of decaying the stump. Water in crevices helps to soften the wood. Freezing and melting water in the cracks hastens the disintegration. Poison ivy is dangerous to touch at any season of the year. Look for leaves in threes and for white berries. The berries of poison ivy are an important source of food for birds.

3. Concrete Post. Concrete is an artificial stone but it is made from materials that come from the earth. Concrete is made from sand, gravel, cement and water. It is cheaper than obtaining natural rocks of the right size and transporting them. It can also be shaped easily.

4. Ditch. Whenever it rains or snow melts the depression fills. In early spring frogs sometimes lay eggs there. Pigeons and other birds may use it for drinking.

5. "Listening Rock". This is a good rock for sitting. Some can sit on it and some can sit around it. Here is where one listens to the wind in the far pine tree, to autumn leaves as they are blown across the gravel, to the sound of a jay or a robin or a sparrow or ------- whatever can be heard. It is a place to enjoy together but in silence.

6. Norway Maple. This is an immigrant tree so sturdy and tolerant that it thrives in city and country. A milky juice oozes out of the stem when a leaf is broken. The bark feels rough to the touch because of its ridges. It is an excellent shade tree. It has beautiful flowers in spring and winged fruit called polynoses later on.

7. Ivy-Covered Brick Building. Brick is a man-made "rock" but is made from materials which come from the earth; so is the cement which fasten the bricks together. Brick is made from clay, then baked. Cement is made from limestone and clay, then mixed with water. The ivy is English ivy. It is evergreen and is not poisonous. English sparrows frequently nest among its leaves and branches. It is most decorative.

8. Gray Birch. This tree was planted as an ornamental tree. It has white bark which feels smooth to the touch and it has heart-shaped leaves. Chickadees frequently nest in the gray birch trees. In spring its catkins (flowers) hang down. The tiny fruits which fly about in winter look like miniature birds as they lie scattered over the snow.

9. "Quiet Spot". This is a good place to sit and think. From here can be seen most of what is around the area - a good place to contemplate and to enjoy sitting together quietly - to think about whatever comes to mind.

10. Sugar Maple. This is a native maple which contributes maple sugar products. In the fall it adds to the beautiful colors of the landscape.

11. Gravel Portion of Parking Lot. Gravel may come from a natural earth deposit or it may be made by crushing rock. The parking lot has desert-like characteristics. However, grass, plantain and dandelion grow through the gravel in places.

12. Barberry. This plant is a shrub that is very hardy. It has spines on the twigs, small yellow flowers and attractive red berries which are sometimes eaten by birds.

13. Ragweed. Although the pollen offends many hayfever sufferers, this tall plant attracts many birds in the winter. The fruit which provides nourishment remains high above the snow.

14. Oak Tree. Where there are oak trees there are squirrels feeding on the acorns. This pin oak, frequently grown in cities, has bottom branches pointing downward. Many galls are found on oak leaves. Pigeons often roost in trees as in this pin oak.

15. Bird Bath near a Multiflora Hedge. The bird bath and the hedge attract birds. The bath provides water. The hedge provides food and shelter. The spines on the hedge make it useful for protection. In the spring tiny white roses bloom on the hedge.

16. Goldenrod in Bare Sunny Spot. These golden flowers grow in open areas in a variety of habitats. They are beautiful in the fall. Many galls are formed on the plants. Goldenrod is not as much a cause of hayfever as is ragweed. The fruit provides some winter nourishment for wildlife.

17. Bird Feeder Hanging from a Cultivated Cherry Tree. Cherry trees have beautiful pink flowers before the cherries are formed. The wood has a typical cherry fragrance. The smooth dark bark has horizontal markings.

18. Hydrant. Smartweed, grass and dandelion grow at its base. It is in an unmowed part of the grounds. Plants benefit from the moisture which collects around the base of the hydrant.

19. Kindergarten Playground. Paved areas, iron fences, swings, slides, bare soil, a sandbox, holes from digging, fringes of grass and weeds are typical of this much-used area. There are grasses and other plants also growing through the cracks of the macadam.

KINDERGARTEN KINDERGARTEN

Some Problems

1. What kinds of living things do we see outdoors?
2. What sounds do some living things make?
3. What things which are not living do we find outdoors?
4. What sounds do some of them make?
5. How big is the biggest rock at each station where there are rocks? What size is the tiniest piece of rock at each station?
6. Which station has most light? Which is the darkest? Where do you find most plants?
7. Which living thing takes up the most space?

Science and Conservation Concepts

1. There are living and non-living things.
2. There are more kinds of living things outdoors than indoors.
3. Living and non-living things are found near each other, sometimes on or in each other.
4. You can recognize many things by the sounds they make.
5. Some things occupy more space than other things.
6. Light from the sun does not reach some parts of the earth.
7. More plants grow where there is sunlight.

Discussion Questions

1. How can you grow plants indoors in a dark corner if these plants are found growing outdoors in a sunny area?
2. How could more sunlight reach some of the shady spots outdoors?
3. How could you find out whether some crowded plants which grow outside your school would grow better if they were not crowded?
4. What unpleasant outdoor sounds should be stopped?

GRADE ONE GRADE ONE

SOME PROBLEMS

1. How many different kinds of animal homes can you find? Where are they?
2. In which places at each station does the wind blow strongest?
3. Can you recognize any one kind of plant which grows at every single station?
4. How close together do you find birds in bushes, under bushes, on the ground, in trees, on a pavement, on roofs, on overhead wires?
5. Where is it cooler on a warm day, in the shade of a tree or in the sun outside of the tree's shade? Where is it warmer on a cold day?
6. Which trees would you pick for Christmas trees?

SCIENCE AND CONSERVATION CONCEPTS

1. Animals live where they find food, water, protection from enemies and a safe place to raise their babies.
2. Although our winds usually blow from the west, they frequently change.
3. Some plants are fitted to grow almost anywhere, such as grass, plantain.
4. Animals, like plants "space themselves".
5. Trees help to change the temperature of the air around them.
6. Trees such as pine, spruce and hemlock are green all year.

DISCUSSION QUESTIONS

1. How would you attract rabbits to live around our school? robins? bluebirds? earthworms?
2. What plants which might grow best around our school can we use if we wish to make our school look more attractive?
3. How could we make our play area cooler in summer, warmer in winter and less windy at any time?
4. How can we make certain that even though we use evergreen trees for Christmas that we do not run out of Christmas trees?

 GRADE TWO

SOME PROBLEMS

1. What evidence can you find that animals use plants as food?
2. What parts of all plants are green?
3. What happens to the roots of a fallen tree? What happens to the hole left by the fallen tree?
4. What evidence can you find that changes have taken place on some rocks outside?
5. Where can you find examples that the roots of plants keep water from washing soil away?

SCIENCE AND CONSERVATION CONCEPTS

1. Animals depend on plants for food.
2. All green parts of a plant make food.
3. Certain animals can be discouraged by destroying their plant food.
4. Certain animals can be encouraged by planting certain foods.
5. Roots are torn up when trees fall, leaving a pit.
6. Plants and animals can be found living in pits made by fallen trees.
7. Soil comes, in part, from rocks which crumble.
8. Roots of trees hold soil and rocks tightly and prevent the soil from being washed away.

DISCUSSION QUESTIONS

1. What kind of food would you plant to attract field mice. rabbits, chickadees, geese, muskrat, raccoons, humming birds?
2. How would you keep woodchucks and rabbits away from your garden?
3. How can you attract night visitors like skunks, cockroaches, raccoons, oppossums, moths?
4. How can you discourage such night visitors?
5. When should a rotting log or a stump be removed?
6. When should they be left to decay?

GRADE THREE

SOME PROBLEMS

1. Which plants in your outdoor area should you avoid?
2. How many insects can you discover which are the same color as the place where you found them?
3. What is the largest number of nests which you can find in one tree?
4. What kinds of plants attract most birds?
5. What animals do you find on, in, around and under a stump? What is each animal doing there?

SCIENCE AND CONSERVATION CONCEPTS

1. Some plants are poisonous if touched.
2. Some plants can prick or cut the skin.
3. Animals are not easily seen when they are the same color as their background.
4. Some animals feed on insects which feed on plants.
5. Birds defend a certain amount of territory.
6. Many plants which produce berries as fruit attract birds.
7. Plants which provide shelter for nesting attract birds.
8. Plants which provide material for making nests attract birds.
9. Many different kinds of animals are found on, in, around and under a rotting log and stump.

DISCUSSION QUESTIONS

1. Suppose many birds were attracted to the berries on a poison ivy vine outside your home. However you do not wish to get poison ivy. How would you remove the vine without harming people or birds?
2. How close should nests of birds be placed in order to attract these birds? Consider the purple martin and the bluebird as examples.
3. What part of your outdoor laboratory is natural? What part was made by man?

 GRADE FOUR

SOME PROBLEMS

1. Examine some plants in order to find the beginning of next year's plants. Where do you find these beginnings?
2. Where do you find cocoons, spider egg cases, praying mantis egg cases, earthworm egg cases?
3. Compare the temperature of several animal homes. Which is the warmest? Coolest?
4. How do living conditions for plants and animals on top of a rock compare with those under a rock?
5. How did some garden plants begin to grow in your outdoor area? How do the plants protect the soil?

SCIENCE AND CONSERVATION CONCEPTS

1. Seeds are the beginning of next year's plants.
2. Plants also begin to grow in other ways such as from cuttings and bulbs.
3. Worms live in the ground.
4. Spiders form homes for young under rocks, leaves, fence rails, etc.
5. Some animals line their homes with leaves or other materials. Lined homes are soft and warm.
6. Insect eggs are laid in many different places such as under or on leaves, in "tents", in "nests".
7. It is more moist and warm under a rock than on top of it.
8. Rain water forms little streams which can carry soil particles.
9. Plants prevent erosion of soil.

DISCUSSION QUESTIONS

1. How do oak trees and squirrels relate to each other?
2. How do earthworms affect crops?
3. How do plants which are found in vacant lots and parking lots get started?
4. What do you have to know about a plant or animal before you try to encourage it to live in a certain place?

GRADE FIVE GRADE FIVE

SOME PROBLEMS

1. Observe several different kinds of animals. How does each type move? What part of the animal is used for locomotion?

2. Compare the outside covering of several different living things such as birds, squirrels, trees, people, chipmunks, leaves, earthworms, insects, snakes.

3. Can you discover some plants which grow only in sunlight, some which grow only in the shade, and some which grow in both sunlight and shade.

4. What kinds of plants do you find among gravel, in cracks of pavement?

5. Where do you find plants which grow in the least amount of soil?

6. What kinds of plants and animals do you find living on and under an old rotting log as compared to those on and under a newly fallen log?

SCIENCE AND CONSERVATION CONCEPTS

1. Animals move by means of legs, wings, muscles, bristles.

2. Plants usually remain in one place; other agents, such as wind or water might move them or part of them.

3. Different animals have different body coverings.

4. Only birds have feathers.

5. Water birds oil their feathers.

6. Only mammals have fur.

7. Insects have their skeletons on the outside; we have ours on the inside.

8. Plants and animals can be grouped according to their likenesses and differences.

9. Different plants need different amounts of light, air, water, soil.

DISCUSSION QUESTIONS

1. Why is a certain amount of space necessary for plants?

2. What can animals do which plants cannot do, if the animals need more food?

3. What is happening to the amount of available living space for people in the world? in cities?

4. How is man interrelated with all the other living things in your area?

5. What has been changed by man in the neighborhood where you live? What changes seem unwise? What can be done to remedy mistakes in your area which were made by man?

GRADE SIX

GRADE SIX

SOME PROBLEMS

1. Compare the number and kinds of animals in your outdoor laboratory with backbones and without. Which seem to require more space to live?
2. How are worms different from birds and squirrels?
3. How are samples of rocks and samples of soil taken from several stations alike? How are they different?
4. What is the largest living thing on the trail? How much air touches it?
5. Where in your area is there some soil which would wash away if erosion were not checked either naturally or by man?

SCIENCE AND CONSERVATION CONCEPTS

1. Animals can be classified according to whether or not they have backbones.
2. Animals as well as plants require a definite amount of space for living.
3. There are different kinds of rock.
4. There are different kinds of soil.
5. There are many ways to prevent soil erosion.
6. Soil, water, air are needed by all living things.
7. All animals depend on plants directly or indirectly.
8. All life depends upon energy from the sun.
9. Each living thing depends on other living things. You cannot destroy or change one kind without affecting others.
10. You cannot alter any part of the environment without affecting many living things.

DISCUSSION QUESTIONS

1. How might the following changes in our environment harm man: draining marshes, overcrowding cities, increasing the number of roads and cars, spraying areas with DDT to control insects?
2. How do people in corwded cities, many of whom never see soil or sunlight remain dependent upon soil and sunlight for survival?
3. How do artificial fertilizers threaten our water supply?

GRADE SEVEN GRADE SEVEN

SOME PROBLEMS

1. Which plants growing around here are harmful to man in some way?
2. What percent of the kinds of plants which grow around here are not harmful?
3. What forms of non-flowering plants can you find? What evidence do you find that there is an association between such plants and soil formation?
4. What likenesses and differences do you find among the trees outdoors?
5. What kinds of animals are found in water nearby? in holes in trees? in holes in the ground? at a feeder?
6. How do artificial man-made rocks compare with natural rocks in your outdoor laboratory? What uses of each can you find?

SCIENCE AND CONSERVATION CONCEPTS

1. Nitrogen-fixing bacteria live in nodules on the roots of certain plants such as clover.
2. These bacteria improve the fertility of the soil.
3. Poison ivy may take many forms: as a simple low-growing plant, a shrub, a vine.
4. The poison of poison ivy is present on the plant at all times of the year.
5. Ragweed is very common. Its pollen is a cause of hayfever.
6. Lichens, mushrooms, puffballs break down the wood of dead trees, causing them to disintegrate and form soil.
7. There are many different kinds of habitats.
8. There are many different kinds of natural rocks.
9. Man has made a variety of artificial rocks.

DISCUSSION QUESTIONS

1. Poison ivy and ragweed are two plants that are harmful to man but beneficial to wildlife. Should they be destroyed or encouraged?
2. How do the adaptations of certain plants and animals enable them to survive more successfully than other which lack such adaptations?
3. How has man's adaptability enabled him to make almost every part of the earth suitable for habitation?

GRADE EIGHT GRADE EIGHT

SOME PROBLEMS

1. Find a stump of a tree. How old was the tree when it died? How can you tell? How big around was the tree when you were born? What might have caused the narrow rings? What conditions seem to have affected the tree's growth? At what age did each happen?

2. Compare the number of living trees with the number of dead ones. How many are elms? What is the appearance of the bark of a dead elm tree? How does it compare to that of a live elm?

3. Find evidence of a rock crumbling, a log crumbling. What will eventually happen? What agents are causing their decomposition?

4. Compare the life in a water community such as a pond or lake or stream or ditch with life under a log. What organisms serve as food for others?

5. What conditions of living and non-living things are the same and what conditions are different in a comparison of a woodland area, a parking area, a playground?

SCIENCE AND CONSERVATION CONCEPTS

1. Elms in America are dying.

2. There are two kinds of elm bark beetles attacking elms.

3. Dutch elm disease is a fungus disease transmitted by spores. Egg, larva and pupa stages of elm beetles are passed inside elms right under the outer bark.

4. Adult elm bark beetles bore their way out of elm trees through the bark, leaving tiny holes.

5. Annual rings of trees vary in width and shape from year to year. Ring size is affected by conditions such as available sunlight, fire, insects, amount of rainfall.

6. Everything is changing, building up or breaking down. Nothing is static.

7. Every living organism fits into an ecological niche.

8. In order to control an organism which is a threat to a plant or animal one must first study its life history.

DISCUSSION QUESTIONS

1. What should be done with all the dead and dying elm trees?

2. What might be the hazards and benefits of introducing a predator for the purpose of destroying an organism whose large population is undesirable to man, such as the elm bark beetle?

3. Compare a dead elm with a junked automobile. Consider their appearance, hazards, usefulness originally, usefulness at present, materials out of which they grew or were developed, destiny of their materials as they decay.

OUTDOOR DISCOVERY GUIDES

What a Discovery Guide Is:

It is an aid to individualizing inquiry. This technique may be used indoors or outdoors. When children go outdoors in the immediate environment of their schools and they have a problem to solve, they are going to manipulate something or observe or compare or carry on some process necessary to solve their problem. A discovery guide directs them to collect the kind of data which is needed. It avoids confusion. It reduces talking by the teacher to a minimum, allowing for individual attention.

Objectives of Discovery Guides:

1. To foster the natural curiosity which children have about the world around them.

2. To guide children to learn about their environment both indoors and outdoors by getting them involved in the process of finding out for themselves.

3. To give children a chance to appreciate science as a method of discovery through solving problems.

4. To emphasize the ecological approach by including studies in the physical and biological aspects of the environment.

5. To help foster the kinds of attitudes and appreciations which lead to understanding how a scientist works: to explore things in depth rather than superficially, to be accurate and unbiased, to collect sufficient evidence, not to jump to conclusions.

6. To stimulate interests and to develop skills which enable children to investigate for themselves.

7. To develop an understanding of the out-of-doors as well as of the indoors and possibly lead to interesting hobbies of various kinds.

8. To create an awareness that our resources are not restricted to soil, forests, fish and wildlife; but that they also include peace, quiet, clean air, space and beauty.

9. To lead children to the enjoyment of the esthetic beauties in the outdoors and to explain the privileges and duties each one has to make it possible for others to obtain the same enjoyment.

10. To appreciate conservation as it develops from an understanding of the ecological interrelationships in our environment and to recognize that man is part of this "web of life".

EXAMPLES OF FOUR DISCOVERY GUIDES

Description of the examples:

Four examples of discovery guides are presented as samples of the kinds of aids which teachers can develop to direct children to use methods of inquiry in problem-solving situations, in urban as well as in rural areas.

The first one is for use with a very young group, K or Grades one or two. It concerns investigating the variety of colors to be found among the flowers growing on the school lawn, in a weed patch, on a tree, in a window box, or at a florist. The aim is to sharpen powers of observation. The teacher will probably explain the directions orally. The investigation may take two fifteen-minute outdoor sessions followed by the suggested discussions which are held indoors afterwards.

The second example of a discovery guide is designed for grades three or four and is especially suitable for urban areas although it is applicable to any paved area so that all rural schools can make use of this approach too. It deals with uses of artificial and manmade rock materials, all stemming from the earth's resources.

The third example is an outdoor discovery guide useful for a fourth or fifth grade planning an investigation of outdoor habitats which exist near their school. The guide is printed so that when the sheet is folded along the dotted lines a small handy booklet is made. This is convenient for carrying and using in the field. Since instruments (thermometer, compass, magnifier) are used which are time-consuming, two sessions might be provided for the habitat investigations outdoors. Two indoor sessions for the suggested discussions might follow.

The fourth discovery guide, recommended for a fifth or sixth grade is for the indoors and outdoors. The "seed packages" should be collected outdoors. The number of sycamore balls and milkweed pods should be counted at the same time that the collections are made. Sycamores are commonly planted in urban areas. The number of these per plant might be counted outdoors. The careful counting of seeds is then carried on indoors, followed by interpreting the data in a series of discussions.

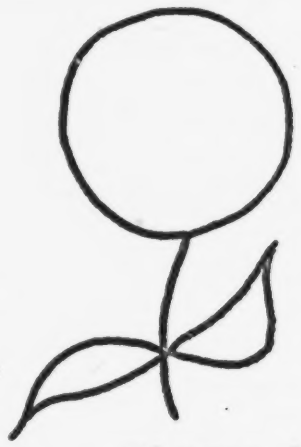
EXAMPLE 1 -- (For Kindergarten, Grade One, and Grade Two)

NAME _____

INVESTIGATION: What colors are the flowers outside?

1. Find a flower which is in bloom. Do not pick it. Which of your crayons makes a color that looks like the flower? Color this circle with that crayon.

2. Now color the leaves with the crayon which looks most like the leaves of this plant.

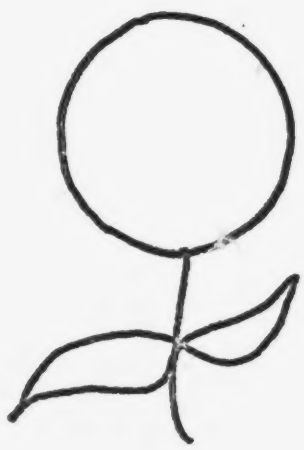


Flower 1

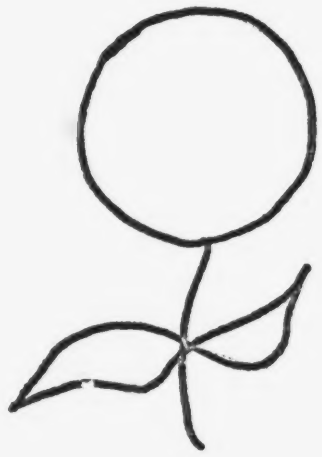
3. Find four (4) more flowers, each of a different color. For each of these four (4) flowers pick out matching crayons and color a circle and the leaves.

Flower 2

Flower 3



Flower 4



Flower 5

DISCUSSION:

1. Which parts of these five (5) flowers are the same color?

2. Which parts are different colors?

3. How can we use flowers to make our school look more attractive?

EXAMPLE 2 -- (For Grades Three and Four)

NAME: _____ Grade: _____

TEACHER: _____ Date: _____

Problem: What kinds of hard areas are there around the school?

Materials: Pencil, clip-board for guide sheet, a small plastic bottle of warmed vinegar with medicine dropper or weak hydrochloric acid.

1. Walk around the school. Examine buildings as well as what is under your feet. Place a check next to every hard surface which you discover. Write in any that you find but which have been omitted from the list.

A concrete pavement or sidewalk _____
A stone sidewalk or pavement _____
A brick pavement or sidewalk _____
A gravelled path or pavement _____
An asphalt path or pavement _____
A path paved with wooden planks or blocks _____
A pavement of hard packed earth _____
Any other kind(s) _____

_____

_____

2. Which of the materials are natural? (in the same form as they occur in the earth)

_____

3. Which are artificial? (not in the same form as they occur in the earth)

_____

4. Which have limestone products in them?

_____

Discussion Questions:

1. How are manmade rocks different from natural rocks? What materials which are natural, are used in artificial rocks?
2. Why are artificial rock materials used?
3. From where will more natural rock materials come after all that there is in the earth is used up?
4. Which materials from the earth are used to ornament buildings?
5. Why is glass being used more and more in constructing large buildings?
6. Could you design a more attractive use for both the natural and artificial rocks which you have observed?

EXAMPLE 3 -- (For Grades Four and Five)

This one fold along the lines into a small booklet.

Environment

Environment

Animals

Animals

Building

Plants

Plants

Habitat I

Habitat II

2. Make a simple map of your outdoor area: then place the letter of each habitat you visit on the map. Try to explore two habitats.

3. For each habitat which you explore tell what you learned about the plants, the animals, the environment:

Name:_____ Date:_____
Teacher:_____ Grade:_____

Investigation: Who lives where?

A study of habitats:

Materials: Pencil, compass, thermometer, magnifier.

1. Place a check next to those habitats which you find outside your school.

A. Roadside
B. Fields - 1. Planted
2. Abandoned
C. Woods
D. Hedgerows
E. Swamp area
F. Rotting log
G. Stream
H. River
I. Bank
J. Standing dead tree
K. Living tree
L. Marsh
M. Swamp
N. Vacant lot

Discussion:

What might happen if:

A. All the water were drained out of the pond?

B. All the land were flooded?

C. A fire broke out?

D. All the dead and dying trees were removed?

E. The woods were bulldozed to make room for a new building?

F. DDT were sprayed in order to get rid of the insects?

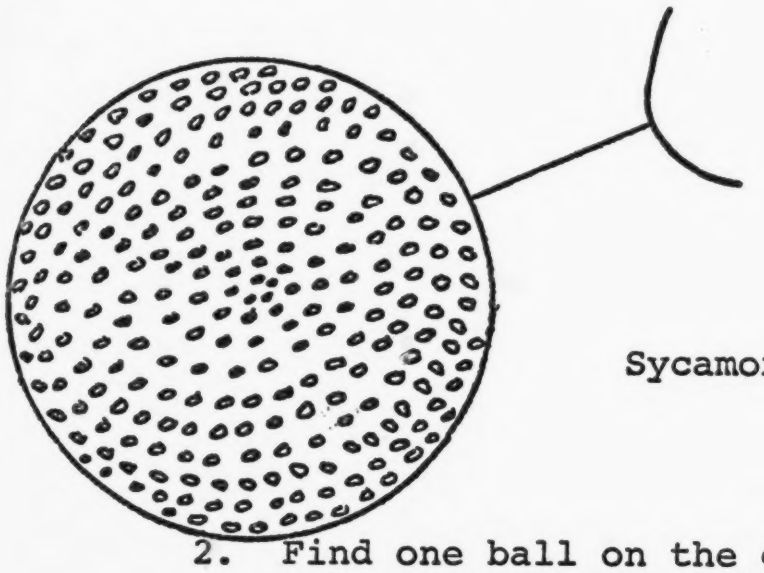
EXAMPLE 4 -- (For Grades Five and Six)

Name: _____ Teacher: _____

Date: _____ Grade: _____

Problem: How many seeds does one sycamore tree produce?

1. Locate a sycamore tree. Count the number of balls.



Sycamore balls

A. Number of sycamore balls on one tree.

2. Find one ball on the ground. Indoors, count the seeds. Make a check for every 20 seeds which you count.

Checks for sycamore seeds. (Each ✓ = 20 seeds)

3. Multiply the number of seeds by the number of balls on the tree. About how many seeds does one tree produce?

B. Number of sycamore seeds on one tree.

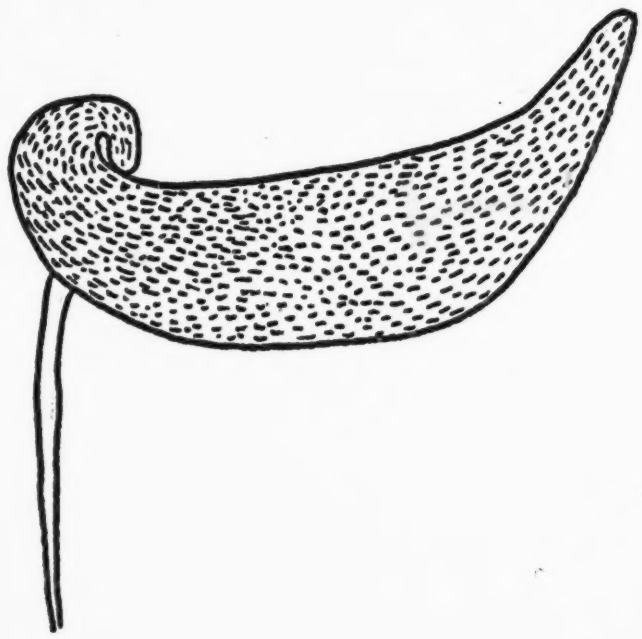
Name: _____ Teacher: _____

Date: _____ Grade: _____

II.

Problem: How many seeds does one milkweed plant produce?

1. Locate a milkweed plant. Count the number of pods.



Milkweed Pod

A. ☐ Number of milkweed pods on one plant.

2. Find one pod on a plant. Indoors, count the seeds. Make a check for every 20 seeds which you count.

☐

Check for milkweed seeds. (Each ✓ = 20 seeds)

3. Multiply the number of seeds by the number of pods on the plant. About how many seeds does one plant produce?

B. ☐ Number of milkweed seeds on one plant.

Discussion:

1. Why isn't the world full of sycamore trees or of milkweed plants?

2. How does the habitat of one compare with the other?

3. How near to one sycamore is the next?

4. How near to one milkweed is the next one?

5. Which plant requires more room?

6. How does the sycamore affect other life around it? How is it affected, in turn?

7. How does the milkweed affect the landscape? Other life around it? How is milkweed affected?

BOOKS

Ashbaugh, Byron L. and Muriel Beuschlein. Things to Do in Science and Conservation. Interstate Printers and Publishers, Inc., Danville, Ill., 1960.

Brown, Vinson. How to Explore the Secret Worlds of Nature. Little, Brown and Co., Boston, 1962.

Busch, Phyllis S. Lions in the Grass, The Story of the Dandelion, a Green Plant. World Publishing Co., New York, 1968.

Busch, Phyllis S. Once There was a Tree, The Story of a Changing Home for Plants and Animals. World Publishing Co., New York, 1968.

Carvajal, Joan and Martha E. Munzer. Conservation Education, A Selected Bibliography. Interstate Printers and Publishers, Danville, Illinois, 1968.

Conservation Foundation Audio-Visual Center. A Critical Index of Films and Filmstrips in Conservation. Conservation Foundation, 1250 Connecticut Ave. N.W., Washington, D.C., 20036.

Dale, Alan. Observations and Experiments in Natural History. The Natural History Library, Anchor Books, Doubleday and Co., Garden City, New York.

Munzer, Martha E. and Paul F. Brandwein. Teaching Science Through Conservation. McGraw-Hill, New York, 1960.

Stapp, William B. Integrating Conservation and Outdoor Education into the Curriculum (K-12) Burgess Publishing Co., Minneapolis, Minnesota 55415, 1965.

Youngpeter, J.M. Winter Science Activities, Holiday House. New York, 1966.

BULLETINS, PERIODICALS AND VISUAL AIDS

Audubon Bulletin, National Audubon Society, 1130 Fifth Avenue, New York, New York 10028.

CF Letter. Report on Environmental Issues from the Conservation Foundation, 1250 Connecticut Avenue, N.W., Washington, D.C.

Conservation in the City (underfoot, eyelevel and overhead). Filmstrips on conservation for primary grades by Phyllis S. Busch with teaching guide. Encyclopaedia Britannica Educational Corporation, 452 No. Mich. Ave., Chicago, Ill., 60611.

Bulletins, Periodicals and Visual Aids (continued)

The Conservationist. State of New York Conservation Department, Room 339, State Campus, Albany, New York 12226. Subscription $1.00 per office year if mailed to elementary school.

Cornell Science Leaflets, Stone Hall, Cornell University, Ithaca, New York 14850. $1.00 per year or 25¢ per issue.

Curious Naturalist, Massachusetts Audubon Society, Lincoln, Massachusetts 01773. 10 issues $2.00, bulk rate $1.25.

Nature and Science, Natural History Press, Garden City, New York 11531. $3.50 per year, bulk rate $1.95 per school year.

Nature Study. The American Nature Study Society RD #1, Homer, New York 13077.

Ranger Rick's Nature Magazine, 381 West Center Street, Marion, Ohio, 43302. $6.00 per year (published by the National Wildlife Federation, 1412 16th St., N.W., Washington D.C. 20036).

Science and Children, The National Science Teachers Association, 1201 Sixteenth Street, N.W., Washington, D.C. 20036. $4.00 per year.

An Approach to School Site Development (19 min., sound, color, 16mm). International Film Bureau Inc., 332 South Michigan Ave., Chicago, Illinois.

Natural Areas at Schools, Leaflets 1 and 2, American Nature Study Society. Broad Brook Press, Bennington, Vermont 05201. 20¢ each.